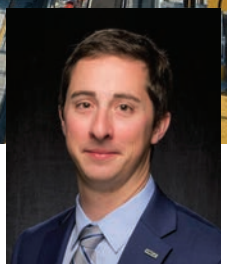

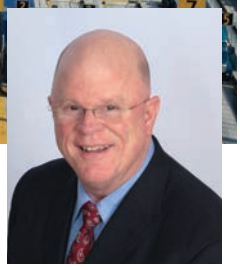

DELIVERING 600 AUTO STACKING CRANES

FIVE LESSONS LEARNED

John Huschilt, Sales Application Engineer/Crane Systems, and
Alan Peterson, Business Segment Leader/Crane Systems at TMEIC

TMEIC Corporation (TMEIC), which is headquartered in Roanoke, Virginia, USA, has managed to meet the ever-increasing demands of customers globally by delivering over 600 auto stacking cranes. From facing the ice and snow of New Jersey to the arid heat and dust of Abu Dhabi and points beyond, TMEIC has accomplished world class automated performance which drives world class terminal productivity.

TMEIC provides the automation systems which manage the operation of cranes in varying degrees of semi or total automation. Our experience integrating advanced automation on high speed rail mounted gantry cranes, wide span intermodal cranes, and both single and double cantilevered rail mounted stacking cranes is extensive.

The following is a short list of important lessons TMEIC has learned over the last 16 years on nine different sites globally, through 17 major project efforts.

LESSON ONE: FUNCTIONAL SPECIFICATIONS… SETTING MUTUAL EXPECTATIONS

A functional specification is the written description of how a completed system should perform. It drives the discussion of how your terminal will perform and how your vendors will deliver what you need. It is the first step for a vendor in developing a control system concept based on user requirements and identifying the system requirements regarding data gathering, interfaces, environment and technical and physical constraints. It is focused on how the automation system will operate in production, how various elements of the system will interact and function together, how safety systems will behave, and many more concerns.

The discussion and development of a functional specification between automation supplier and end user should happen at the earliest stages of the project. It provides information to assist the automation supplier is understanding what functionalities the customer desires and why. It also reduces the likelihood of any misunderstanding as to what the customer wants and what the automation system vendor can provide.

Most project schedules are so compressed that this important conversation is often overlooked, minimised, or eliminated. Therein lies the foundation of much frustration between the owner's project team and the vendor.

The lesson learned is that by having these types of detailed essential discussions at the beginning of the project one eliminates possible expectation gaps between customer desires and vendor deliverables. It increases the chances that what the automation system provider delivers will satisfy not only the technical requirements specified by the crane builder but also the specific needs of the

end user. Such a process also avoids rework and saves everyone valuable time at all stages of development, implementation and production.

LESSON TWO: CIVIL WORKS… THEY MATTER

Civil works matter, and they matter a lot. Across many different projects, TMEIC has frequently experienced two major concerns regarding civil works which have impacted both start up schedules and terminal productivity.

We find the first problem caused in the building of an automated terminal to be that most terminal operators do not give themselves enough time to do the civil works construction. This then leads to time compression for the balance of project deliverables.

Most project cycles work backwards from a 'go live' date when the terminal needs to be ready to service ships and start making money. Often, this 'go live' date has production contracts associated with it which put an even greater urgency on completion. The 'go live' date is fixed, so when civil works take more time than expected every other downstream commissioning effort suffers a shortened time allotment in which to deliver.

Vendors delivering sub-systems are all negatively impacted when time is compressed. Delivering an excellent commissioning outcome is the goal of every equipment vendor on the project, and delays in civil work cause significant problems in delivering the desired result.

A second problem caused by civil works which were not planned and executed well, is a hit to the productivity of the terminal after operations begin. Many port projects are built upon reclaimed land or land that has stability issues inherent to coastal areas. Terminals may underestimate the amount of below grade structure required to adequately support the rail systems needed for heavy stacking cranes. When terminal operators underestimate the amount of support needed to keep rail systems straight and level over many years of operational use, the result is reduced productivity of one of the most crucial asset groups at the terminal.

Our industry demands that automation systems deliver millimetre level accuracy. It doesn't take much of a shift in the crane's position due to deteriorating rail systems to cause highly accurate automated actions to deteriorate. In addition to lost productivity, the resulting efforts to maintain rails, adjust and calibrate lasers, and deal with excess wear and tear on mechanical components in the crane all cause increased down time and lost productivity for the port.

The lesson learned is that a decision to shortcut civil work design or poor execution of civil work installation will haunt an automated terminal for the balance of its life. Civil works matter, and they matter a lot.

LESSON THREE: IT'S WEATHER… DEAL WITH IT

It doesn't matter where on the globe an automated terminal resides, weather is always going to play a role in how well the terminal operates. The challenge to the automation supplier and the crane builder is how to mitigate the effect of weather on the performance of the crane.

Laser sensors in the market today have evolved a great deal over the last 15 years. Even so, there is no perfect sensor for every task, and no perfect software to meet every challenge. Custom software tools provided by the automation system provider enhance the laser sensor's ability to perform in most kinds of weather.

Dealing with rain and snow were the early successes of signal filtering. At one of TMEIC's project sites we recently saw the adjacent international airport shut

down due to a heavy snowstorm while the terminal continued to run in automated mode. The automated systems were able to filter out the impediment of snow on laser signal response and still manage to locate targets and deliver box moves as designed.

The lesson learned is that dealing with weather induced obstacles is not easy. A terminal should ensure the selected automation system supplier is well positioned to address a number of severe weather conditions that may arise.

LESSON FOUR: REMOTE CONNECTIVITY... GOT TO HAVE IT

Cyber security is a must in today's environment where hackers are constantly trying to upset our networks, steal our data, and impact our ability to conduct business. The challenge for machine builders and automation suppliers alike is the need to balance cyber security with the need to remotely access machines and software platforms during commissioning and start up.

Having high demand software experts sitting for weeks on every project start up location is no longer feasible. The ability to access machines and software systems remotely has matured and stabilized to the point that experts are likely most effective in supporting a project from their primary office. The same can be said for highly skilled mechanical design engineers who do the same for mechanical systems.

Terminals continue to further restrict both remote and local access to their cranes and systems. This is an obvious and justifiable action to help protect themselves from the all too common security threats that abound. But here is where issues arise for suppliers trying to deliver an excellent on-time project outcome.

The typical commissioning field engineer is adept at solving a wide array of problems and concerns when bringing to life complex, highly technical systems which control auto stacking cranes. There are times however when the oversight of an expert is needed to help the on-site engineer fine tune and adjust systems. With remote connectivity help is only minutes away, and solutions can be determined and applied rapidly.

The lesson learned here is that a discussion needs to happen in the very early stages of a project to determine how the terminal operator is going to allow remote access to the equipment and software being delivered. At the same time, they must ensure their cyber security is not compromised. This is not an easy discussion, but one that must take place.

LESSON FIVE: LOWEST COST... NOT ALWAYS BEST

From big industrial organizations to our own personal pocketbook, each one of us must manage our budgets and evaluate the benefit of an item against its cost. Most of us would love to buy the "top-of-the-line," but somehow our pocketbook is not always deep enough to facilitate such a purchase.

Over 16 years of delivering auto stacking crane systems, we have seen the mania for low initial cost drive bad outcomes many times. We have seen terminals deal with the aftereffects of decisions that were made to save cash early on, but resulted in unreliable equipment and ongoing civil work repair. This has led terminals to operate at reduced capability leading to increased operational costs and reduced productivity. Hindsight is of course perfect.

Just a short list of examples for this lesson:

- Civil Works
  - Discussed above.
- IT Infrastructure
  - Equipment that works great in an office environment will not always work great on a crane, or in an outdoor enclosure exposed to heat and cold. Routers that will work for years in an office utility closet, will fall apart from the vibration and shock of riding on a crane. Spend the money for hardened equipment that will endure the stress of the job it is intended to do.
  - Outdoor networks are different than indoor networks. When laying out the civil works to include underground pipes for IT backbone infrastructure, be sure to add more pipes as spare than you think you need. It is not easy to run an additional fiber line through the dirt and concrete of your stacking yard after it is built. Set up the future of your underground outdoor network for expansion, maintenance, and even things you cannot anticipate.
- Total Cost of Ownership
  - There are often substantial differences in the total cost of ownership equation from one vendor to another. One should consider the ongoing costs of items, like mean time between failure for machine systems, how long it takes to repair major components when they do fail, cost of spares, availability of service technicians, availability of remote support systems, the list goes on. Failing to incorporate the experience and expense of living with the equipment after the commissioning team is done and gone is big mistake.

The lesson learned here, buy on value within the limits of your budget. Buying the least expensive today may look good for the initial capital budget, but could have major, long lasting ramifications affecting the terminal's operational budget for years to come.

ABOUT THE AUTHORS

John has been in the maritime industry since 2007 when he first attended New York Maritime College. His first years were spent on and under the water in various operation and maintenance roles, both with conventional and nuclear power. In 2016 he moved shoreside to project management, overseeing maritime projects and construction priorities of national interest. Shifting to TMEIC in 2018, John currently works as a material handling Sales Application Engineer, helping terminals find unique solutions for their biggest challenges.

Alan has been involved in technical sales since 1978 joining first Westinghouse and then GE in 1989. Transitioning to TMEIC in 2006, Alan has since worked full time Container Terminal automation and advanced lifting equipment technologies. Currently acting as Business Segment Leader for the Crane Systems business group within TMEIC, responsibilities include managing a global sales force, the commercial activities of the group and helping to shape the strategic direction of the business.

ABOUT THE ORGANIZATION

TMEIC has a long, proud history in the crane industry, supplying equipment and systems throughout the world. TMEIC's control systems are designed to meet the most demanding applications and environmental conditions, including the latest in automation for both manned and unmanned operation to maximise crane productivity.